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REVIEWS.

Studies from the Yale Psychological Laboratory. Edited by Edward W. Scripture, Ph.D., Director of the Psychological Laboratory. Vol. VII. New Haven, 1899. 8vo, pp. 108.

THE volume contains two articles: 'Researches in Experimental Phonetics' and 'Observations on Rhythmic Action,' both by Dr. Scripture. This review will concern itself only with the first article.

The 'Researches in Experimental Phonetics' deserves the careful consideration of phoneticians. Dr. Scripture is a laboratory man, and he uses laboratory methods in his researches. Though his regular line of work is psychology, this article is devoted exclusively to phonetics and prosody. He has devised a lever machine that greatly enlarges the records on gramophone plates, and it is these records that he uses in his experiments. The researches 'were begun in order to settle the controversy in regard to the quantitative character of English verse,' but, in reality, the larger part of the article is taken up with a study of the nature of some of the speech-sounds—particularly the diphthong *ai* in *I*, *eye*, *fly*, *die*, and *thy*. We are told that this is but a first report, and that there are other researches in progress that cover a much broader field.

Dr. Scripture is not the first to study gramophone and phonograph records, as he himself shows in his introduction, but his methods are so simple and he introduces them with such vigor that they are likely to be employed by others. If these methods prove to give accurate results, Dr. Scripture's work will have been, directly or indirectly, of great service in phonetics, prosody, and kindred subjects. It is for this reason that the fundamental presupposition underlying his methods should be investigated with extreme care. It would almost appear that it has not occurred to Dr. Scripture that gramophone records may be inaccurate. For him the only difficulty seems to lie in the interpreting of the record. But the question may justly be asked: Can the gramophone records be

absolutely relied upon? And this needs more than a cursory answer.

I have listened to several phonographs, graphophones, and gramophones, but I have never heard one which seemed to me to give an entirely natural reproduction of the voice. There was always something lacking or out of proportion in the representation. Phonograph dealers have told me that it is a difficult task to get even the best records. It requires experience, and even then it is almost impossible to get good records for some people and for some musical instruments. When one considers the make-up of the machine it becomes clear that there are many possibilities for inaccuracy. For instance, there are the various resonance chambers, there is the vibration rate of the glass disk, and then there is the complicated process of making a plate. All these things make it possible for error to creep in. It is not the purpose of this review to condemn graphic methods, but to call the attention of experimenters to the imperfectness of the tool they are using, and to the need of thoroughly testing it. One should whisper a passage to the machine, and see how accurate the report is. A long series of tuning forks could be tried to see if each note is returned with equal accuracy. One could take a trombone and blow glides into it. And such questions as the following might be asked: Does it give back the exact relative pitch and the exact relative intensity? and, Does the machine give back the fundamentals and overtones in exactly the right proportions? It may be that Dr. Scripture's instruments are entirely accurate, but there are several of his results that phoneticians would hardly care to accept until this is shown to be so.

Again, in order to be sure of his results, Dr. Scripture should make his own records and not have to rely on purchased ones. In beginning the study, he should use only one subject, whose speech habits he knows perfectly. He should take note of all the conditions under which each record is made, and he should have many records. Dr. Scripture at times appears to be somewhat rash in drawing conclusions from insufficient material. As an example of this we may say that from the record of *h* in *who* he generalizes for all *h*'s.

We may now consider briefly some of Dr. Scripture's par-

ticular results. After an excellent introduction, he begins a study of the diphthong *ai* as it is found in the nursery-rime *Cock Robin* and in one or two short prose selections. He uses the National Gramophone Company's records, for which Mr. W. H. Hooley, an elocutionist, is the speaker. In his treatment of this diphthong he brings out some startling results. For instance, instead of the second part of the diphthong being the weaker, his records show in most cases that it is from $1\frac{1}{2}$ to $2\frac{1}{3}$ times that of the *a*! For almost all of his *a*'s there seems to be a fixed note of about 1000. Louis Bevier, in the *Physical Review*, vol. x, p. 193, working on phonograph records, also finds a similar note, but with a vibration rate quite a little above this. Whether this is a mouth resonance tone, as is suggested, or a resonance tone due to the machine, can only be determined by careful investigation.

Dr. Scripture would appear to go too far in some of his statements. Thus, he concludes that *eye* and *I* are different fundamentally, although the ear cannot distinguish between them (p. 36). He says, in general, with reference to *ai*, that '*ai* is not the sum of the two vowels *a* and *i*, but an organic union into a new sound *ai*'. Thus, there is no necessary pause or sudden change of intensity or change in pitch or even change in character' (p. 53). This is, of course, true so far as a pause is concerned; in fact, the statement might be made much more positive. To be true of character, the statement can be made only with emphasis on the word 'sudden.'

In the course of his paper, Dr. Scripture treats briefly the subject of punctuation. He puts a period after the third line in the first stanza because Mr. Hooley in his one reading paused there. Later (p. 36) he gives us his philosophy of the subject. He implies that there is still an accepted theory which relates punctuation and time. He tells us that possibly 'this theory may have to be modified, as later researches have shown that comma pauses may be long and semi-colon and colon pauses may be very short.' He seems, however, still inclined to hold the 'accepted' theory.

Dr. Scripture discusses at some length the various vowel theories. He favors Willis's theory that the mouth tone is independent of the cord tone in regard to pitch. He believes that he has shown with absolute certainty that this must be so.

But again the question arises: Are the gramophone results absolutely reliable? Rayleigh, in his '*Theory of Sound*,' vol. II, p. 477, says that from graphic records the fundamentals are either weak or lacking, but that in experiments with resonators they are found to be most important. This is a divergence well worth noting. If it is true that phonographs and gramophones slight the lower fundamentals, we cannot feel so sure of Dr. Scripture's conclusions. So once again we see the need of a thorough investigation of the reliability of the machine.

The cut on page 59, in which is given the whole record for 'Who'll be the parson?' presents much that is interesting. The machine gives here no record for *p*, *b*, *th*, and hardly any for *s*. This seems to disclose a serious weakness in the gramophone as a scientific instrument.

The last few pages of the article are devoted to the study of *Cock Robin* with a view to the settlement of the controversy in regard to the quantitative character of English verse. To Dr. Scripture the task must appear an easy one, if such a little nursery-rime can settle it. *Cock Robin* is not a fair example to stand for the whole of English verse. It belongs to folk poetry, and has certain peculiarities of its own. But the whole treatment of the subject shows an unconsciousness of the difficulty of the problems involved, and a lack of acquaintance with the present views of verse theorists.

There is another matter that the reader's attention should be called to, which surprises one in the work of a laboratory man. I refer to the errors to be found in the cuts and diagrams. Fig. 5 does not agree with fig. 7, nor with its own description. Not only in the case of fig. 6 (acknowledged by Dr. Scripture), but also in that of fig. 18, fig. 24, fig. 29, fig. 33, fig. 42, etc., the scale reads 100, 200, 400, 300, 500 . . . Moreover much of the actual plotting is wrong. In fig. 6 the height of *i* is drawn over 300. It should be 250. Fig. 15 has the *a* curve up to 4 and then down again. It should be constant 3. But on page 49, Dr. Scripture says that fig. 15 is carefully plotted. Further errors will be found in fig. 28 and fig. 32. Errors so serious as these throw over the work as a whole an uncomfortable element of doubt.

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